

Duplex, ureterocoele and ectopic ureter

Duplication abnormality 0.8% postmortem

Majority incomplete and asymptomatic

Complete duplications less common (<0.1%) but more often symptomatic

Incomplete duplications bilateral in 40%, complete bilateral in 25%

Embryologically:

Arise as a result of second ureteric bud developing adjacent to normal bud. The upper pole ureter is quite close to mesonephric duct and drawn down with duct during fetal growth, whereas the lower pole ureter is under less influence, explaining why the upper pole ureteric opening is always caudal to the opening of lower pole ureter (Meyer-Weigart Law). Degree of dysplasia (usually upper pole) related to degree of ectopia (indicates more extreme penetration of metanephric blastema, with resultant abnormal nephrogenesis)

NB. dysplasia is a histological diagnosis. When referring to x-ray features suggestive of a dysplastic kidney, more correct to use the term hypoplasia

Classification of associated abnormalities:

Lower pole

VUR

Occasionally dysplasia

Upper pole

Duplex system ureterocoele*

Suprasphincteric ureteric ectopia

Boys – vas, seminal vesicle, ejaculatory duct

Girls – bladder neck, proximal urethra

Infrasphincteric ureteric ectopia

Girls only – introitus, distal vagina

Selected duplication incidences

Unilateral incomplete duplex	1:100
Bilateral incomplete duplex	1:250
Unilateral complete duplex	1:1000
Bilateral complete duplex	1:4000
Unilateral duplex with ectopic ureter	1:10000
Bilateral duplex with ectopic ureters	1:100000
Duplex system ureterocoele	1:5000
Bilateral duplex system ureterocoele	1:50000
Single system ureterocoele	1:25000
Bilateral single system ureterocoele	1:250000

Duplex system ureterocoele

Incidence 1:5000

80% females

Whites >> blacks

Left > right

10% bilateral

Upper pole moiety affected

May be orthotopic (entirely intravesical), or ectopic (more common; often at bladder neck or rarely level with urethra/introital in girls (caecourethrococoele))

Typically a/w upper pole dysplasia and impaired renal function

Ipsilateral lower pole

mild VUR in 50% of cases

occasionally obstruction 2' to ureterococoele itself

usually preserved renal function

Usually diagnosed prenatally (60%); otherwise UTI, AUR, or rarely prolapse

Readily evident on USS; further investigation includes DMSA to identify dysplasia, and MCUG to identify reflux [reflux involving both kidneys always a/w incomplete duplication]

Management

Complex and depends upon presence of symptoms and associated lower pole and ipsilateral findings

Indications for surgery

Symptoms

Preserved ipsilateral upper pole renal function

Ipsilateral lower pole obstruction

Bladder outflow obstruction

Ureterococoele prolapse

Ipsilateral lower pole reflux and UTI

Surgical options (depends on upper pole function)

(i) Functioning upper pole

a. Endoscopic ureterococoele incision

Simple, minimally invasive

Can induce reflux (do it close to bladder wall)

Reasonable medium term results (some view it as temporising measure)

b. Ureterococoele excision and re-implantation

For non-dilated units

Re-implantation of both ureters in Waldeyer's sheath (typically Cohen cross-bladder technique)

c. Pyelopyelostomy

For dilated lower pole moiety

Ureterococoele and distal ureter aspirated and left in situ

(ii) Non-functioning upper pole

a. Upper pole nephrectomy

aka 'simplified approach'

Upper pole moiety excised

Ureterococoele and distal ureter aspirated and left in situ

b. Upper pole nephrectomy, ureterectomy and ureterococoele excision

Gold standard

Requires 2 incisions

Risk of damage to bladder neck and vesicovaginal fistula in girls

- Reimplantation of ipsilateral lower pole ureter often required
- c. Nephrectomy
 - For globally reduced ipsilateral function
 - Refluxing ureters should be excised, but non-refluxing ureterocoele can be aspirated and left in situ

Single-system ureterocoele

Boys > girls

Almost always orthotopic

Prenatal vs. clinical (incidental, UTI, AUR)

Typically renal function is preserved

Management

Observation

Surgical intervention for symptoms or obstruction

Endoscopic incision vs. ureterocoele excision and re-implantation

Ectopic ureters

1:10,000

Usually females

Contralateral duplication (usually incomplete) in 80%

Bilateral infrasphincteric ectopia (leaking girls) in 10% of cases

Typically detected prenatally

Suprasphincteric usually present as UTI (often epididymo-orchitis in males)

Infrasphincteric as constant dribbling incontinence in girls (or persistent vaginal discharge in those with poorly functioning upper pole – minimal urine, pools in vagina)

Clinical diagnosis

USS	dilated distal ureter behind bladder dysplastic upper pole moiety may be missed (cryptic duplication)
DMSA	documents function
MCUG	may identify suprasphincteric reflux
IVU	'absent' upper pole calyx 'drooping flower' deviated lower pole moiety 'scalloped' lower pole ureter (deviated laterally by grossly dilated upper pole ureter) May identify infravesical ectopia
Cystoscopy	combined with EUA suprasphincteric ectopia typically identified at bladder neck: often misses infravesical ectopia. Then instil methylene blue into bladder and insert vaginal pads [if blue and wet = bladder; clear and wet = infravesical ectopia] NB. Bilateral infrasphincteric ectopia in 10%. Careful identification prior to planning surgery

Management

Suprasphincteric

Non-functioning upper pole
Heminephrectomy usually suffices
Ureterectomy for reflux

Functioning upper pole
Reimplantation

Infrasphincteric

Non-functioning = heminephrectomy
Functioning = re-implantation

Single-system ectopia

Single vaginal ectopic ureter

Slightly less common than duplex

Similar presentation – often referred as unilateral renal agenesis and incontinence

DMSA or MRI may help locate renal tissue which may itself be ectopic
Nephrectomy curative

Single proximal urethral ectopic ureter in girls – re-implant vs. nephrectomy

Very rarely may be bilateral in girls. a/w small bladder, BN and sphincteric incompetence – Mx = bilateral re-implant, bladder augmentation +/- bladder closure and mitrofanoff

Ectopic kidney

1:100 to 1:500

90% unilateral

left > right

60% pelvic

Often hypoplastic & irregular; associated with other GU abnormalities

Horseshoe kidney

1:400

95% lower polar fusion; 5% upper pole

Level

40% orthotopic

40% below IMA

20% pelvis

Ascend limited by origin of IMA

20% have associated PUJ abnormalities

Associated with congenital abnormalities (10% of patients with Turner's syndrome)

Crossed renal ectopia

Uncommon

Incidence ranges from 1:1000 to 1:2000 (from Campbell's)

Males > females

Occasionally a/w VACTERL (typically solitary crossed renal ectopia)

4 types:

Crossed fused (85%)

Left-to-right more common than right-to-left

The superior pole of the ectopic kidney usually joins with the inferior aspect of the normal kidney

Crossed non-fused (<10%)

Solitary

Bilateral

Clinical sequelae uncommon – occasionally low grade reflux

Megacalycosis

Non-obstructive enlargement of renal calyces due to abnormal development of papillae. Non-dilated renal pelvis and ureter.